# ESA-133-2, Domtar Paper Company, LLC - Kingsport, TN, Plant Public Report

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| **Company** | Domtar Paper Company, LLC | **ESA Dates** | July 16 – July 18, 2007 |
| **Plant** | Domtar, Kingsport, TN | **ESA Type** | Process Heating - PHAST |
| **Product** | Paper | **ESA Specialist** | John Clarke |

## Brief Narrative Summary Report for the Energy Savings Assessment:

**Introduction:**

Domtar Corporation is the largest integrated producer of uncoated freesheet paper in North America and the second largest in the world based on production capacity, and is also a manufacturer of papergrade pulp. The Company designs, manufactures, markets and distributes a wide range of business, commercial printing, publication as well as converting and specialty papers. Domtar owns and operates Domtar Distribution Group, an extensive network of strategically located paper distribution facilities. Domtar also produces lumber and other specialty and industrial wood products. The Company employs nearly 13,000 people.

The Kingsport Mill was originally opened in 1916 and completely rebuilt in the early part of this decade. It represents state of the art process and energy systems. The mill utilizes a sulfur-free pulping process in the United States. Notable achievements and awards include the 2006 Chamber Environmental Award , State Clean Air Award, SFI certified, ISO 14001 certifiable, and the Governor's Manufacturing Excellence Award.

**Objective of ESA:**

The objective of the ESA was four fold:

1. Introduce the PHAST program to plant personnel.
2. Train plant personnel on the use of the PHAST program by applying it to real world applications. During this phase, assess the strengths and weakness of the analysis and develop methods to ensure an accurate outcome.
3. Facilitate a discussion of fuel savings opportunities among the participants.
4. Identify and quantify specific energy savings opportunities. Estimate required resources. Focus on projects that fall within the corporate payback targets.

**Focus of Assessment**:

During the ESA, the participants investigated the thermal performance of:

1. The Lime Calcining Kiln
2. Eight Storage tanks
3. The $ClO_2$ heat exchanger
4. The fiberline hot water system.

For the Kiln, areas analyzed included heat containment and burner efficiency. For the eight storage tanks, surface heat loss was calculated and opportunities for containment considered. The improvement in process efficiency of commissioning an existing $ClO_2$ heat exchanger was calculated. Lastly, the impact from reduction of overflow hot water from the fiberline hot water system was examined.

**Approach for ESA**:

Working with plant personnel, the agenda was altered to obtain the most valuable outcome. In brief, the process went as follows:

Discussed the overall process and provide plant personnel time to determine the best target(s) for the analysis. This discussion included:

A. The ESA and Save Energy Now program
B. Program and Plant expectations
C. A preliminary discussion of required steps.

1. Target Equipment Identification
   - Identify which process heating device(s) will be used for the assessment. Suggested criteria includes:
     A. The equipment type should represent a significant use of energy.
     B. There should be a means to collect operating data from the equipment that will be entered into the PHAST program for analysis.
     C. Participants should suspect the machine(s) represents significant energy savings opportunities.

The Group decided to examine the performance of the Lime Calcining Kiln, eight storage tanks, the ClO2 heat exchanger, and the fiber wash water system.

2. Review Heat Supply and Demand (Sankey Diagram)

3. Review the PHAST program – illustrating what data would need to be collected

4. Collected Basic Information for entry into the PHAST program.
   a. Cost of energy inputs – steam and natural gas.
   b. Measured surface temperatures of various devices.
   c. Entered work flows and specific heats of materials being processed
   d. Collected data from individual natural gas flow meters.
   e. Estimated furnace surface areas.

5. Entered the above data into the PHAST program. For the Calcining Furnace, checked veracity of the analysis by comparing expected results to actual meter readings.

6. Created a spreadsheet to summarize information using outputs from the PHAST program.

7. Discussed ongoing and potential projects aimed at improving system energy efficiency. Determined which projects would be complementary to existing initiatives.

8. Perform "what if" analysis for various energy savings opportunities.

a. Decrease the excess O2 in the products of combustion in the Lime Kiln. Further analysis will be required to ensure O2 reductions do not contribute to either material fouling or excess CO formation, but a preliminary target of a 2% reduction was settled on to illustrate the value of tighter combustion control. If a 2% reduction in O2 can be effected, the savings will be approximately 17,497 mmBTU in natural gas, an annual savings of $ 139,973. per year or 2.2% of total plant natural gas usage. While illustrative, it was later determined that a 2% reduction in excess O2 is not practical.

b. Increase the back up insulation by 2" to reduce kiln heat loss. Further analysis will be required to ensure that the reduction of inside cross sectional area does not adversely effect production rates. The increased insulation, will reduce heat loss through the outer shell of the kiln so as to save approximately **24,360** mmBTU in natural gas or **$ 194,884**. per year or 3.1% of total plant natural gas usage.

c. Add insulation to eight process tanks. These tanks include the digester Blow Tank, a Combined Condensate tank in the Fiber system, the roof of a Filtered Green Liquor tank (632.7070), the Foul condensate storage tank, the Roofs of Weak Black Liquor Tanks #1 and #2 (613.7005 and 613.7006), the Screen dilution tank (321.7030) and Screen Room Filtrate tank (321.7200) The savings resulting from the insulation of these tanks would be 1,782,300 Btu / hour or **15,996** mmBTU / year worth **$ 25,434**. per year. This also equates to 1,143 pounds per hour 75 PSIG steam or approximately 0.3 % of the plants 75 PSIG steam consumption.

d. Eliminate the current 200 GPM overflow of 125 F hot water in the fiberline system. This will result in a savings of **48,384** mmBTU / year worth **$ 76,931**. per year. This also equates to 4,800 pounds per hour 75 PSIG steam or approximately 1.1% of the plants 75 PSIG steam consumption.

e. Complete the installation of a heat exchanger in the ClO2 bleaching system. This will result in an annual savings of **55,440** mmBTU / Year worth **$ 88,150.** per year. This also equates to 5,500 pounds per hour 75 PSIG steam or approximately 1.3% of the plants 75 PSIG steam consumption.

9. Discuss / Estimate expected capital / implementation costs for “what if” opportunities. Completed a spreadsheet illustrating the expected paybacks.

10. Presented our findings to plant management group

**General Observations of Potential Opportunities:**

Total Plant Natural Gas Usage – 780,224 mmBtu at an average cost of $8.00 / mmBtu for a total annual cost of approx $ 6.2 million

**Near Term opportunities**

Improvements in Kiln insulation, provided there are no negative impacts on production, would reduce natural gas consumption by 24,360 mmBTU or 3.12% of the plant’s total natural gas consumption worth $ 194,884. per year.

Increasing the backup insulation would need to be accomplished during routine refractory maintenance. The incremental cost of the additional insulation would be approximately $ 113,000. although the expense would be incurred incrementally. The payback for the increase in insulation would be approximately 0.6 years. While payback indicates a near term return, this project would take several years to complete.

Total Plant 75 PSIG steam Usage - approximately 424,000 pounds per hour or 4,396,000 mmBTU / year. The base cost to generate this steam was not calculated but the incremental cost of steam is $ 1.59 / mmBTU.

**Near Term Opportunities**

Eliminate the current 200 GPM overflow of 125 F wash water in the fiberline system will result in a savings of **48,384** mmBTU / year worth **$ 76,931**. per year. This also equates to 1.1% of the plant’s total 75 PSIG steam consumption. If this required a projects who’d cost is $ 25,000 – the resultant payback would be approximately 0.3 years.

**Medium Term Opportunities**

Completion of the installation of a heat exchanger in the ClO2 bleaching system would result in an annual savings of **55,440** mmBTU / Year worth **$ 88,150.** per year. This also equates to 1.3% of the plant’s total 75 PSIG steam consumption. This project was estimated to cost $ 250,000 – the resultant payback will be approximately 2.8 years.

**Management Support and Comments**:

Management recognizes further study is required to fully access the efficacy of the recommendations but is strongly committed to the continued reduction of natural gas.

**Notes**:

While not covered by the scope of this assessment. The group discussed the opportunity to improve the efficiency of the biomass boiler by reducing the moisture in the fuel.